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CONE PENETROMETER SUPPORT: OPERATION, MAINTENANCE, AND R&D ACTIVITY CONDUCTED ON THE OTD CONE PENETROMETER VEHICLE

TECHNOLOGY NEED

The DOE is seeking new technologies to assist in its efforts to characterize and remediate hazardous waste sites under its control. The DOE's goal is to use technologies that will reduce costs and improve the quality and timeliness of both site characterization and remediation. To help meet this goal, DOE has purchased a cone penetrometer truck that will conduct research and investigations at various sites throughout the country. This system is referred to as a Site Characterization and Analysis Penetrometer System (SCAPS).

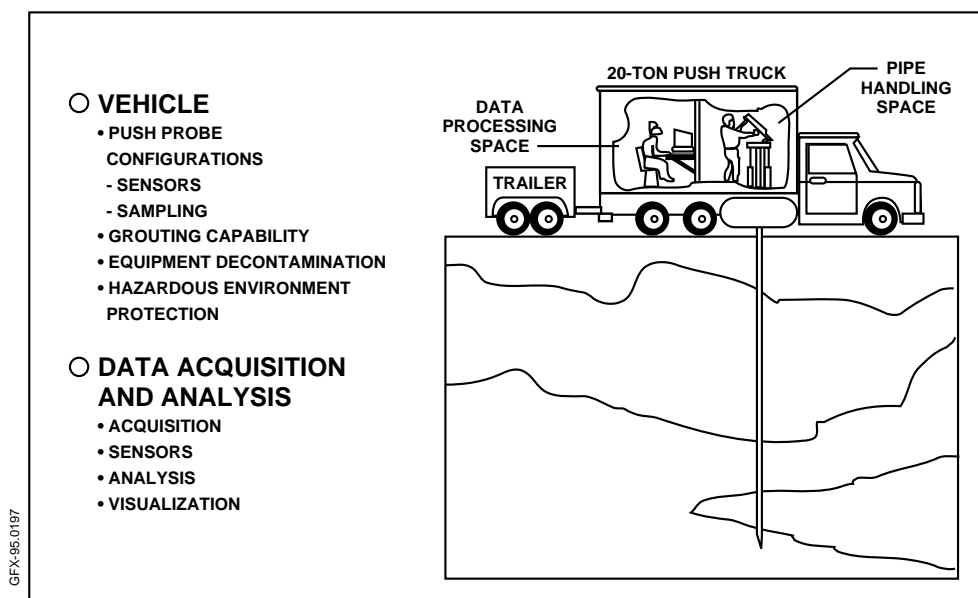


Figure 1.2-1 Site Characterization and Analysis Penetrometer System (SCAPS) Description.

TECHNOLOGY DESCRIPTION

The cone penetrometer has proven to be a safe, accurate, rapid, and cost-effective means for obtaining both subsurface samples and sensor readings of physical, geochemical, and geophysical information. The technology used in the cone penetrometer, namely hydraulic advancement of small-diameter rods, is significantly less invasive than drilling technology. It is also much safer to operate because no waste cuttings are brought to the surface. The cone penetrometer measures various parameters continuously and provides numeric measurements of material properties over the entire depth of the test. The cone penetrometer has been used effectively to retrieve

soil, groundwater, and soil gas samples. Its use in the environmental field is still in the developmental stage, but the technology has great future potential for obtaining a variety of subsurface data without bringing potentially contaminated subsurface materials to the surface.

The DOE and other government and private organizations have invested in technologies to expand the capabilities of the cone penetrometer for environmental investigations. Argonne has extensive experience in the use of the cone penetrometer, as well as in the use of a wide variety of drilling and sample collection techniques for site characterization. This experience is being used to support the field testing and evaluation of sensors and samplers for the cone penetrometer to ensure that the test environments and data interpretations are correct.

The ultimate goal of this project is to develop technologies that will broaden the capabilities of the cone penetrometer for environmental investigation and monitoring. Intermediate goals are (1) to evaluate potential new sensor, sampler, and analytical technologies in combination with the development of the necessary computer interfaces; (2) to select appropriate field sites in coordination with the Westinghouse Savannah River Company (WSRC), and to plan and execute field trials and evaluations of the new technologies; and (3) to communicate the results of the evaluations to the public and private sectors.

BENEFITS

This technology, when used in conjunction with site geological and hydrogeological controls, will enhance the integrated approach to site characterization, which is applicable at many DOE hazardous waste sites. Use of the cone penetrometer reduces the potential for exposure of site exploration personnel to hazardous materials because no wastes are brought to the surface. This approach also significantly reduces the volume of hazardous material that must be controlled and discarded as a result of the characterization. Similar benefits are realized when the cone penetrometer is used to place sampling devices in the subsurface for site monitoring.

This technology will increase versatility in sampler and sensor techniques, including borehole geophysics. Improved interactive computer software systems for real-time data acquisition and analysis will allow rapid on-site decision making.

COLLABORATION/TECHNOLOGY TRANSFER

At the beginning of FY96, a permanent base of operations was established for the SCAPS at SRS. Argonne is working with WSRC to select sites that provide the specific characteristics and contaminants needed to evaluate the new technologies. In addition, Argonne is working with the developers of these new technologies to establish the criteria for evaluation of their technologies, and to design the necessary interfaces with the SCAPS. Applied Research

Associates, Inc. (ARA) is the operations and maintenance contractor for the SCAPS.

With the completion of the demonstration phase of the SCAPS, Argonne has begun technical evaluations of sensors, samplers, and in situ analysis methods that can be adapted to the SCAPS. This phase will examine emerging and existing technologies that may be adapted to cone penetrometer technology. Results of these evaluations will be disseminated through published reports and presentations at DOE-sponsored meetings.

ACCOMPLISHMENTS

- Completed demonstration phase of the program. Using a variety of tools and techniques, demonstrations were conducted at Fernald Environmental Management Project; Pantex Site; the Portsmouth Gaseous Diffusion Plant; Dover Air Force Base; Beckley, West Virginia for the National Mine Health and Safety Academy; and Savannah River Site.
- Field trial of the position locator device (POLO), developed by UTD Incorporated.
- Field trials of three soil moisture probes, including two probes developed by ARA and Geomet, that use frequency domain reflectometry, and the time domain reflectometry probe (TDR) developed by Robert Knowlton at Sandia National Laboratories.
- Evaluation of two devices for the detection of petroleum, oils, and lubricants: the laser-induced fluorescence detector (LIF), developed by the U.S. Army Corps of Engineers Waterways Experiment Station; and the fuel fluorescence detector (FFD), developed by ARA.

TTP INFORMATION

Operation, Maintenance, and R&D Activity Conducted on the Cone Penetrometer Vehicle (SCAPS) technology development activities are funded under the following technical task plan (TTP):

TTP No CH23C222 "Penetrometer Support: Operation, Maintenance, and R&D Activity Conducted on the OTD Cone Penetrometer Vehicle (SCAPS)"

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BIBLIOGRAPHY OF KEY PUBLICATIONS

None available at this time.